

# A STUDY OF HEREDITY IN AN ISOLATED VILLAGE COMMUNITY

By J. W. McFEETERS, M.D., B.Ch.

THE village which was my home for several years was an ideal one from the point of view of studying heredity, since its isolation had apparently been almost complete for centuries until comparatively recent years; while the hostility of its inhabitants towards strangers was so marked up to the end of last century that marriages into families outside the village were very rare, as also was the entry of new families into the community. This naturally limited the range of selection in mating, and so increased the likelihood of occurrence of rare recessive characters. It was, indeed, the frequent occurrence of rare diseases among the people of the village that first made me take an interest in heredity.

The village is one of about 1,500 inhabitants, and until recently, owing to the nature of the surrounding country, access to it has been from one direction only. It is obvious, therefore, that, though first-cousin marriages have been rare, the same stocks were bound to mate in generation after generation; while, apart from the isolation of the community itself, other factors have diminished still further the range of choice in mating. For example, church and chapel families remain fairly

definitely segregated. Tradesmen's and labourers' families, too, do not intermarry. Finally, as is generally the case, the members of the "problem group," as it has been called—those of subnormal mentality, the lawless, the alcoholics, the Ishmaels of the community—tend to mate with others like themselves.

The people are of short, stocky build, slow in speech, movement and thought. The standard of intelligence among the labouring class is poor. The village schoolmaster, indeed, who has struggled for many years to find the few encouraging grains of wheat among a most depressing amount of chaff, is of the opinion that there is a much higher percentage of dull and subnormal children in this community than in any of the surrounding villages, in which opportunities for random mating have always been greater.

The more intelligent members of the community belong for the most part to families which have come to the district within the past three or four generations. I show here (Fig. 1) the pedigree of one of the few families of marked intelligence, with some notes on individual members, in order that I may contrast with it a family in which mental development is below the average.

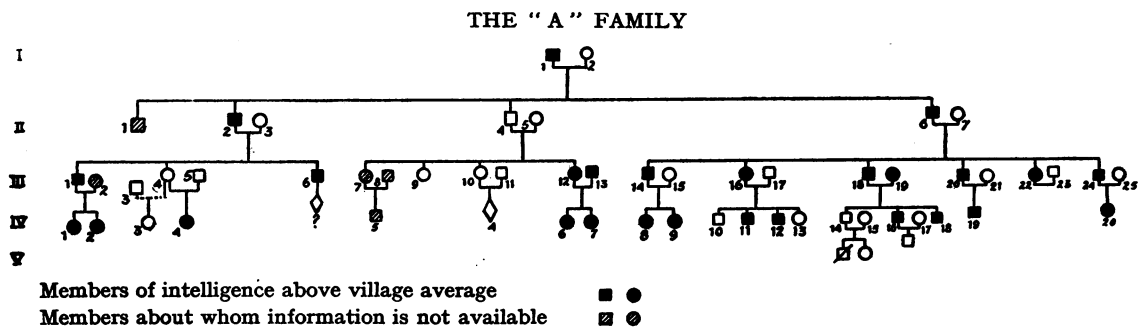


FIG. 1

The grandfather of the man, A.A., shown as I.1 in the pedigree, came on foot from Scotland at the beginning of the nineteenth century, driving his cattle with him, and settling eventually in this village where his descendants remained. He acquired a small-holding and passed it on to his son, who in his turn handed it down to A.A. This man, who was himself well-read, gave his family as good an education at the village school as was in his power in days when most children left school—if, indeed, they went at all—to go to work at the age of nine or ten.

His eldest son (II.1) ran away from home, and all trace of him was lost.

S.A. (II.2) joined the Army and became a sergeant-major in the R.A.M.C. His son, A.A. (III.1), was a lieutenant in the regular army at the time of my investigations. Both his daughters (IV. 1 and 2) are apparently girls of marked ability, having passed their Higher Certificate examinations with several credits. One had gone to London University and the other was taking up music as a career.

H.B. (III.4) remained at home to look after her father in his later years. Her elder girl was illegitimate and is of no special ability. The younger girl gained a scholarship to a secondary school and appears a bright, intelligent girl.

H.A. (III.6) is in business in London and doing well.

To return to the second filial generation, F.A. (II.4) was the least successful of his family, being a horseman all his life on one farm. He was, however, a man of definite intelligence. The only one of his family to show ability above the village average is D.C. (III.12), the elder of whose daughters, J.C. (IV.6), gained a scholarship to High School, while the younger, B.C. (IV.7), has shown marked artistic ability from a very early age.

The youngest member of the second filial generation, A.A. (II.6), was the most able and successful. He was apprenticed to a butcher, and, after some years of hard work and careful saving in various parts of England and Wales, returned to his native village, where he set up as a butcher himself, doing extremely well.

His eldest son, B.A. (III.14), is of rather visionary type and has not succeeded financially, but is a very well-read man, a fluent speaker in the Labour interest and a local preacher. He has written some quite passable poetry which has been published locally. His

daughters, M.A. (IV.8) and D.A. (IV.9), both gained scholarships to High School, while the elder went on to a training college and is now a teacher.

A.A. (III.18) followed his father as butcher. He has done well and extended his clientele for miles around the village, having two motor vans on the road. His second son, R.A. (IV.16), has remarkable musical ability, having acted as organist in two churches, reorganized and trained the village band to prize-winning status and run a dance band with success.

R.A. (III.20) has a good business as a carpenter. His son, L.A. (IV.19), is of outstanding ability. Having obtained a scholarship to the local Grammar School, he gained another to Cambridge University, where, after a series of scholarships and prizes, he obtained a double first, went on to get his D.Sc. at the age of 24 and became a university lecturer in Biology in the same year.

M.H. (III.22) practically runs the large haulage business of which her husband is nominal head. She is noted for her organizing ability in other directions also, and gets up each year an elaborate carnival for the local hospital.

Even the less noteworthy sibs in this family are for the most part of considerably higher intelligence than their neighbours in the village.

Most of the members of this pedigree are above average height. They are generally of rather slight build, with good features and a definitely intelligent look. (So many of the villagers whom I class as descendants of the aboriginal inhabitants have faces utterly devoid of expression or vitality.)

It is interesting, in view of the difference in height of this family, to note the finding of the Anthropological Committee of the British Association, 1878-83, quoted by Moore (1934). The report showed that classes of the community manifesting greatly increased intellectual ability were customarily of greater height, while criminals, lunatics and mental defectives were definitely of low stature.

### A "Problem Group" Pedigree

If, as Gates (1929) suggests, feeble-mindedness is inherited as a simple Mendelian

recessive, this would account for the widespread mental deficiency in the village, since a very large proportion of the members of every generation in the "aboriginal" families must be heterozygous carriers of the factor for feeble-mindedness. A mating of two such apparently normal carriers will produce feeble-mindedness in one quarter of the offspring, two-thirds of the remainder being again carriers of the defect.

On the other hand, Goddard (1914) has traced feeble-mindedness in unbroken succession for five generations, which would seem to imply a dominant heredity. He considers that heredity is the important determining factor in feeble-mindedness, alcoholism and syphilis playing a much smaller part. Baur, Fischer and Lenz (1931) suggest that in slighter degrees of feeble-mindedness the heredity is usually dominant, while in the graver degrees it is generally recessive.

It is difficult to estimate in any section of the population the proportion of feeble-minded or mentally deficient individuals, since so much depends on the standards of normality decided upon by the investigator. As Lewis (1934) points out, the actual delimitation of disease is much more difficult in psychiatry than elsewhere in medicine, since the main psychoses are akin to and often indistinguishable from variations of types of personality which fall within the limits of the normal.

In the country in particular, the custom by which boys and girls were formerly set to work on the land or in service at a very early age accounts for a very high percentage of illiterates among the older members of the

community; and this in its turn handicapped the mental development of their children.

A family tree is here shown (Fig. 2) with a high proportion of feeble-minded members, some of them bordering on the insane. I shall confine myself to giving a few notes concerning the more interesting cases, merely marking the less extreme cases as "simple" without further elaboration.

H.V. (I.7) was recognized by his contemporaries as being "not all there." He never went to school, and got only occasional employment.

M.S. (II.15), his only daughter, was also definitely subnormal in mentality. She married a simple, stolid labourer, by whom she had one daughter, K.S. (III.11), whom I have classified, perhaps euphemistically, as "simple." Some years later, while her husband was still alive, M.S. fell in with a man of equally low mentality with herself—H.G. (II.16)—who had been in the Army for some years, but had been discharged and had spent most of his later life either in the workhouse or in prison.

The result of this liaison was a daughter, A.T. (III.14), who borders on insanity. She is dirty and slovenly, and quite incapable of being trained. Her house, her person and her children are consistently filthy.

Her husband, W.T. (III.15), is quite feeble-minded. He is good-natured and obliging, but is unable to read, or to write more than his own name. He served in the Army during the Great War, 1914-18, and is fond of recounting his experiences in France, which are utterly improbable and are certainly unconfirmed by others who were in the same company.

When A.T. became pregnant for the third time, I referred her, on account of the filthy

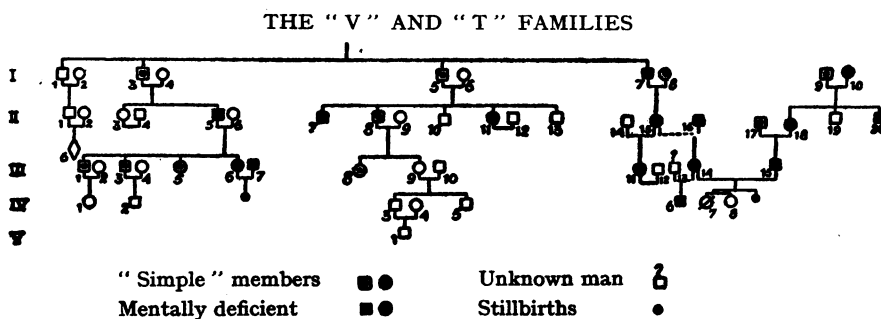


FIG. 2

condition of her house, to the Public Assistance Institution, where she was told to report a few days before term. She put off going, however, and finally started in labour at home. Though there was a former "handy-woman" living only a few yards away, A.T. notified nobody; and the baby (IV.10) was born in the chamber on which A.T. was sitting under the impression that she wished to defæcate. Her husband coming upstairs some time later, A.T. showed him the child, which, with placenta attached, was in the chamber, and he buried it—without wrapping or covering of any kind—in his allotment. The very next day A.T. went herself to a neighbour's house, and told the family there, as an interesting piece of gossip, what had occurred. A post mortem on the infant not showing definitely whether it had had a separate existence from the legal point of view, no police action was taken, the only charge possible under the circumstances being "concealment of birth."

M.T. (II.18), mother of W.T., was of quite defective mentality. She never went to school, being always a helpless, stupid individual. Her brother, C.T. (II.20), is of a very low standard of intelligence. He lives alone—except for innumerable rats—in a house which is incredibly filthy, speaking little to anyone. He cannot read or write, though he is quite a good worker.

Brief mention must be made of some members of the other branches of the family:

R.V. (II.5) is of very dull mentality, his only reply to most remarks or questions being a grunt.

M.B. (III.6), his daughter, is absolutely unintelligent. She can neither read nor write, nor can her husband, H.B. (III.7). So far, their only offspring has been a macerated foetus, born prematurely.

C.V. (II.7) is dull and stupid. He went to school for four or five years, but "could not learn his letters."

M.C. (II.11), his sister, borders on the insane. She never ventures out of the house without her husband. She was rescued from the well in her garden some years ago, but it was impossible to discover whether her presence in it was accidental or suicidal.

The family described here has been chosen because the sibships are small and it can, therefore, be reproduced and described more conveniently. In many other families sibships are large, as is so frequently found in

cases of mental deficiency (Penrose, 1938). Penrose's assertion that, as the mental grade of the patient diminishes below the point which he describes as "the borderline of mental defect," fertility also diminishes, is borne out in the family just described. It will be noted that the only low-grade defectives who have been moderately fertile are A.T. and W.T. (III.14 and 15).

### High Blood Pressure, Cardiac Disease and Obesity

Inheritance of build was studied by me purely in its relation to high blood pressure and cardiac disease; so obesity is the only hereditary abnormality of build for which I prepared pedigrees, since it was almost solely among the families with a high percentage of obese members that cardiac diseases and high blood pressure occurred.

While the hereditary nature of hypertension was noted as early as the sixteenth century, the tendency in recent years has been to inculcate various environmental factors; alcohol, tobacco, worry, mental or physical strain and heavy manual work being blamed, severally or together, for the onset of high blood pressure. Indeed, the tendency to-day—in this country, at any rate—is to minimize the hereditary factor and to magnify the part played by the various stresses of modern life.

Weitz (1923) traced the blood pressures of monovular twins over a number of years, and found that the blood pressures of each pair remained practically equal throughout the whole period. In one case, that of two women who were in later life at the time of his report, one had all her life worked hard in factories and on the land, while the other had lived a quiet life as a town housewife. Yet the blood pressures of these two sisters remained almost identical over the whole period of his investigations.

Addressing the *Deutsche Gesellschaft für Kreislaufforschung* at Bad Nauheim, the same investigator (Weitz, 1936) described his researches into the causation of hypertension over a period of fifteen years, mainly among the phlegmatic peasant population in and around Tübingen. With regard to alcohol,

he carried out experiments on ninety-three persons, reported by the police of Tübingen as heavy drinkers, but found that the incidence of hypertension among them was no greater than in any average sample of the population. Tobacco also, he decided, had no appreciable effect on the blood pressure, nor had excessive work or worry.

In fact, the only external factor to which he assigns any weight is faulty diet. He points out that Africans, Indians and Chinese suffer from hyperpiesia to a much less extent than do Europeans and Americans; but that these peoples, when they adopt a "European" diet, soon begin to show hyperpietic signs. His view, therefore, is that it is a tendency to high blood pressure which is inherited, and that the actual hyperpiesia often becomes manifest through faulty diet.

With regard to cardiac disease, Campbell (1934) points out that in thirty cases of inherited heart disease, associated with arterio-sclerosis, obesity and high blood pressure, investigated by Ryle and himself, twenty-four gave a history of the father or mother being also affected, while in only six cases were both parents free, sibs only being affected. This would seem to indicate that the condition, while usually dominant, may also be inherited as a recessive trait.

The results of my investigations into family histories of heart disease and high blood pressure, and my examinations of living members of such families, have convinced me that there is a dominant hereditary element in these conditions, at all events in the community where my studies were carried out. I did not find a single case of high blood pressure in which at least one of the parents did not show the same morbid condition, and in most cases one or more of the sibs in addition. I would point out that I am simply a general practitioner, untrained in the study of genetics apart from my own reading of the subject over the past few years; but I feel that this whole question of the inheritance of circulatory diseases is of such immense importance that it merits detailed study and investigation by as many observers as possible, particularly in rural

areas, and the correlation of their findings by geneticists and statisticians.

With regard to environmental factors and their possible effect, practically all the inhabitants of the village live under almost identical conditions. They lead, on the whole, placid lives; while their work, if laborious at times, is not as a rule of a type to cause sudden or excessive strain. In fact, an indulgent employer, for whom most of the men in the locality worked until his death in 1935, coupled with a succession of idle foremen, made the laziness of the workers from the village a byword for miles around.

Beer is the only form of alcoholic beverage consumed by most of the men, and, with a few exceptions, their use even of this is temperate. The hyperpietic families, so far as I can ascertain, do not indulge in a diet different from that of their neighbours. In fact, the village presents a comparatively homogeneous whole as regards habits of life, work and diet.

It is interesting, therefore, to note that blood pressures considerably above the average are found almost exclusively among the members of a few families. I reproduce one pedigree here (Fig. 3), showing not only members with cardiac disease and high blood pressure, but also those of marked obesity.

M.F. (I.2) died of heart failure at the age of 36.

E.W. (I.3) became stout about the age of 45. He had a stroke at the age of 60, dying a week later.

E.H. (I.5) died of heart failure at the age of 54.

A.W. (I.4) had, so far as can be discovered, no cardiac or vascular disease, and indeed no illnesses of any kind up to the age of 70, when she developed pneumonia and died.

Her brother, R.W. (I.7), was in regular employment as a road scavenger up to the age of 80. The blood pressures and cardiac condition of all his descendants are normal.

S.P. (II.1) became very stout in the early forties. She led a comfortable and placid life as cook-housekeeper to an easy-going bachelor, who employed a general maid as well. When first seen by me at the age of 58, S.P. was very stout and had a blood pressure of 240/165. She was given advice as to diet. Shortly after

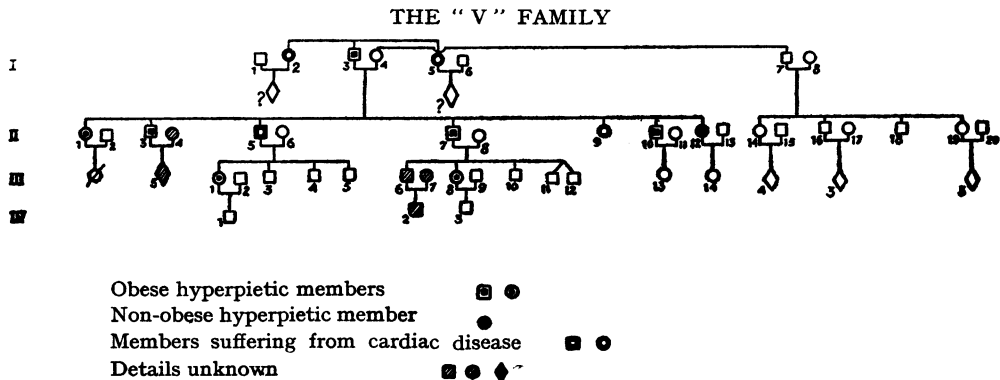


FIG. 3

this she was pensioned off by her employer, and with this pension and her savings she was enabled to live an easy life with a married sister. In spite of this easy life (or possibly because of over-indulgence in foods tending to increase hypertension) a cerebral hæmorrhage occurred at the age of 61, followed by two more within a few weeks, the last of these proving fatal. She did not indulge in alcohol, except for an occasional glass of stout.

E.W. (II.3) lived in London most of his life, dying there of pneumonia at the age of 60. He had become corpulent in the middle forties and had not worked for some months before his death by reason of high blood pressure.

A.W. (II.5) died at the age of 44 from heart failure. His daughter, W.S. (III.1), at the age of 35, weighed 12 stone, though of short build. Her blood pressure was considerably above normal (165/120).

B.W. (II.7) started as a farm labourer, but was never a hard worker. He became very stout about the age of 40, and at the age of 45 had a cerebral hæmorrhage, which left him with marked loss of power in the left arm and leg. On his return to duty he was employed as farm foreman, going from one part of the farm to another in a trap. Thus his work was very light. At the age of 57 he had two cerebral hæmorrhages within a few months of each other, death supervening on the second of these. His blood pressure at this time averaged 195/115. He was a heavy smoker and drinker.

His daughter, F.A. (III.8), at the age of 25, was already very stout. Becoming pregnant, she did not engage either nurse or doctor until the baby's birth was almost due. Before the nurse had had an opportunity of doing a

urine examination, the patient developed eclamptic fits, and was sent at once by me to hospital, where she recovered under treatment. I may add that on her marriage I warned her, in view of the family history, to be careful in her diet and to seek advice at once on becoming pregnant.

H.W. (II.9) died at the age of 20 of "syncope."

W.W. (II.10) at the age of 54 had put on 2 stone in weight within two years, and had then a blood pressure of 175/125. He had been successively labourer, gardener, farm foreman and roadman. He is a light smoker and a very moderate drinker.

E.P. (II.12) leads a busy life, helping her husband with poultry and rabbits and working on the land. Her blood pressure at the age of 45 was 175/120. She is the only member of her sibship who did not show any signs of obesity.

None of the members of the third filial generation, with the exception of W.S. (III.1) and F.A. (III.8), have up to now shown any hypertensive tendency, though it is possible that some of them would be found by the "cold test" of Hines and Brown (1935) to be "hyper-reacting normals."

In another family, for whose pedigree and family history space is not available, only one of seven sibs is of normal build and blood pressure, the others being all excessively stout and showing marked hyperpiesia, though none of them—an interesting point—suffers from cardio-vascular disease to any appreciable extent. In this family, unlike that shown in Fig. 3, the onset of obesity occurred early in life, one of the children at

the age of 9 weighing 8 stone 1 pound. It appears, therefore, as if cardio-vascular disease and hyperpiesia are separately inherited and as if the changes of body build in a family tend to follow a definite pattern as regards age of onset, as is suggested by Davenport (1923).

Of such importance is the frequent association of obesity with cardiac disease, nephritis, diabetes and other hypertonic conditions that MacLaren (1929) stresses its value as a prognostic factor, the mortality from these conditions being much higher in persons of stout build.

The importance has also been emphasized by Cole (1938), who suggests that dietetic treatment should always be tried in cases where obesity is associated with chronic bronchitis, myocardial weakness, high blood pressure, visceroptosis and fascial rheumatism. He finds that occasionally patients fail to respond to dieting, and that in most of these cases the obesity is familial or hereditary. I find, however, that even in obese families members will sometimes respond well to dieting if carefully supervised. For example, the mother of the fat boy mentioned above was under Cole, and was put by him on a diet, as she had had a slight cerebral hæmorrhage at the age of 35. In fifteen months on the diet given her weight fell from 13 stone 6 pounds to 10 stone 7 pounds, and her blood pressure dropped from 235/175 to 155/110.

From the point of view of eugenics, the dominant nature of the heredity usually found in hyperpiesia is of the utmost importance. A person belonging to a hyper-pietic family should not, it is suggested, marry a person with a similar heredity, as the outlook for their children in respect of hyperpiesia would naturally be a poor one. It will be seen, further, that obesity is a factor of immense importance when associated with diseases of the hypertonic type. A study of a family pedigree will enable a practitioner to keep a close watch on the sibs and children of patients, and to institute a suitable dietetic regime at the first sign of increasing weight, so possibly preventing the onset of severe cardiac or vascular complications.

### **Rare Hereditary and Familial Conditions**

The necessity for exact knowledge of the hereditary nature of many diseases and morbid processes is steadily increasing with the passage of time; for, by improved methods of treatment and by the more careful and efficient supervision of ailing children in school clinics and in private practice, numerous persons suffering from conditions formerly considered fatal now reach adult life, and are enabled to marry and to transmit to their children the hereditary defect which would, under less favourable conditions, have disappeared. There is thus a duty devolving on the medical practitioner to study more closely the inherited abnormalities of the various systems of the body, so as to be able to give satisfactory eugenic advice to his patients, and also, so far as possible, to prevent the onset of disease, where both hereditary and environmental factors are concerned.

Inbreeding is found nowhere to so marked an extent as in remote rural districts or in small island communities, for the chance of random mating is there very small. Inbreeding, it is true, is never practised among human beings to the close extent which is experimentally produced in animals and plants; and the fact of inbreeding does not of itself produce disease. The only danger of inbreeding or marriage of cousins is the increased likelihood of a mating of two carriers of one or more undesirable recessive characters.

The increasing urbanization of our population has tended to conceal or obscure the hereditary influence of morbid processes, since so many people in cities have lost touch with other members of their families, and since rare recessive elements are not so liable to manifest themselves there as in isolated rural districts, where there is a more restricted choice in mating. Indeed, in an isolated village, it is in many cases possible to predict the type of disease from which a certain proportion of members of certain families will suffer, and which will probably be at least a contributory cause of death.

I have given elsewhere outlines of several hereditary and familial diseases occurring

in my locality (McFeeters, 1939), and have shown there pedigrees of rodent ulcer and hydramnios (conditions not previously, so far as I am aware, reported as familial), and also a sex-linked pedigree of muscular dystrophy.

It would be of immense value if large-scale investigations could be made into the hereditary or familial elements in various morbid processes. The system of clinics for the study of disease in varying aspects, common in the United States of America and in Germany, might well be imitated in this country, while a closer co-operation between practising physicians, hospitals and geneticists might lead to notable discoveries in the realm of heredity.

The realization that any given disease is inherited as a dominant or recessive character is of immense importance and puts a valuable weapon in the practitioner's hand. It assists him, not only in diagnosis and prognosis, but also in the realm of eugenics, which Rolleston (1934) has termed "the most effective, economical and humane of the departments of preventive medicine."

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